REMARKS

This paper is in response to the official action dated October 1, 2004, wherein claims 1, 2, and 11-13 were rejected as anticipated by Futamura et al., U.S. 4,800,248 ("Futamura"). Reconsideration is requested.

New claims 16 and 17 correspond to original claims 1 and 11, respectively, with the additional distinction that the erosion pulse is interrupted during normal discharge processes.

Please charge our deposit account no. 13-2855 for any fee due for additional claims.

Futamura monitors the magnitude of the discharge voltage. It compares this magnitude with predetermined voltages V_A and V_C. If the discharge voltage is higher than the predetermined voltage V_C, it is assumed that an instantaneous interruption is detected. Similarly, when the detected discharge voltage is lower than the predetermined voltage V_A, it is assumed that a short circuiting is detected. In both cases the electric current to the electrodes is interrupted. (See Futamura, col. 6, l. 59 to col. 7, l. 16).

Futamura does not show the detection of an asymptotic behavior of the acquired voltage ("discharge voltage") or a value derived therefrom. The official action states that an instantaneous interruption, such as waveform V_2 in Fig. 1A in Futamura showing a voltage increase and a subsequent constant voltage platform, is clearly asymptotic. This, however, is not the case, since Fig. 1A in Futamura shows a theoretical waveform of the discharge voltage in the event of an instantaneous interruption which will in practice, however, never occur when following the control principle in Futamura.

Fig. 11 in Futamura clearly shows the possible states of the discharge voltage. If the discharge voltage V falls below the threshold V_A, then the comparator circuit shown in Fig. 10 of Futamura immediately interrupts the current with the result that the discharge voltage also immediately falls to zero. Similarly, if the discharge voltage V succeeds the threshold voltage V_B, then the comparator circuit immediately interrupts the current which means that the discharge voltage also immediately falls to zero.

Summarizing, there is no event where the discharge voltage is kept constant during an instantaneous interruption (for example, as shown in Fig. 1A), since the discharge voltage will have been cut down to zero beforehand by the comparator circuit. Furthermore, the comparator circuit does not detect an asymptotic behavior of the discharge voltage, but compares the actual value of the discharge voltage with predetermined voltage values.

In contrast thereto, the invention, for example, calculates the derivative in time of the discharge voltage in order to decide whether an asymptotic behavior occurs. For this, the derivative in time is compared with a predetermined lower threshold. Simply comparing the discharge value with predetermined voltage levels is insufficient to detect an asymptotic behavior of the discharge voltage. This is in contrast to Futamura.

Further, Futamura deals with the problem of process instabilities such as instantaneous interruptions and short circuiting. In the event of such process instabilities, the current is interrupted and a pulse pause of a predetermined length is introduced until a new discharge is initiated. The invention does not deal with process instabilities but provides a method for determining the ideal moment for interrupting the discharge pulse in order to achieve an optimal material discharge pulse in order to achieve an optimal material removal. The optimal moment is determined by monitoring the voltage applied to the electrode and interrupting the pulse when detecting an asymptotic behavior of this voltage. Therefore, the inventive method is in particular suited for normal discharge processes when no process instabilities occur.

Still further, we further do not agree with the examiner's opinion that claim 13 is shown in Futamura, in particular the feature that "when an instantaneous interruption of discharge current takes place, the discharge current is immediately cut off for a predetermined duration." According to claim 13 the pulse pause (interpulse period t_0) is not predetermined, but proportional to the discharge duration. The appropriate duration of the pulse pause is thus calculated for each discharge pulse.

In view of the foregoing, it is submitted that all claims 1-17 are in condition for allowance, and an indication to that effect is solicited.

Should the examiner wish to discuss the foregoing, or any matter of form in an effort to advance this application toward allowance, he is urged to telephone the undersigned at the indicated number.

Respectfully submitted,

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